

REMARKS/ARGUMENTS

Claims 1-32 are pending in this application. In the pending Office Action, claims 1-5, 8-20, and 22-32 were rejected, and claims 6, 7, and 21 were objected to. In this AMENDMENT AND RESPONSE, claims 1, 13, 22, and 26 have been amended.

I. Objection to the Drawings

Figure 1 has been amended so that it includes the reference number 102 referred to in the specification. A replacement sheet containing the amended version of Figure 1 is appended to this AMENDMENT AND RESPONSE. A sheet showing the changes made to the original drawing sheet containing Figure 1 is also appended for the Examiner's convenience.

II. Objections to the Specification

The specification has been amended to correct the two informalities listed in the Office Action.

III. Rejections under 35 U.S.C. § 102(b)

Claims 1-5, 8-11, and 22-25 were rejected under 35 U.S.C. 102(b) as allegedly being anticipated by U.S. Patent 5,993,632 ("Becker I"). This set of rejected claims contains two independent claims: claims 1 and 22. Applicants assert that Becker I does not anticipate the amended versions of claims 1 and 22.

Claims 1 and 22 have been amended to specify that the current applied to the fluid containing cavity must be produced by an alternating voltage of greater than about 100 V_{RMS}. Support for this amendment can be found, for example, on pg. 9 lines 5-15 of the application. To anticipate a claim, a reference must teach every element of that claim. MPEP § 2131. Becker I cannot anticipate amended claims 1 and 22 because Becker I does not disclose the element of an alternating voltage of greater than about 100 V_{RMS}. Instead, Becker I only discloses a maximum voltage of about 15 V. Becker I col. 7 lines 36-40. It is not clear whether the voltage specified in Becker I is a peak-to-peak or RMS voltage, but in either case the voltage specified in Becker I would be well below the voltage specified in amended claims 1 and 22.

It is worth noting that embodiments of the invention disclosed in the Application are directed toward solving problems that result from the application of "relatively high voltages"

to microfluidic channels. See e.g. Application pg. 2 lines 25-30. One skilled in the art would realize that those problems, such as the formation of bubbles due to faradaic processes, become more prevalent as the voltage applied to a microfluidic channel increases. So at the relatively low voltages disclosed in Becker I, the problems solved by embodiments of the invention are not nearly as significant as they are within the order-of-magnitude higher voltages specified in the amended claims.

Since Becker I does not anticipate amended claims 1 and 2, it cannot anticipate the claims dependent from claims 1 and 22. Those dependent claims, by definition, contain all of the elements of the claims from which they depend. Thus claims 2-5, 8-11, and 23-25 all contain the element of a voltage of greater than about 100 V_{RMS} via their dependency on amended claims 1 or 22. Therefore, claims 1-5, 8-11, and 22-25 should all now be allowable over Becker I.

IV. Rejections under 35 U.S.C. § 102(e)

Claims 1-5, 8-11, and 22-25 were also rejected under 35 U.S.C. 102(e) as allegedly being anticipated by U.S. Patent 6,641,708 (“Becker II”). Applicants assert that Becker II also does not anticipate the amended versions of claims 1 and 22.

Becker II does not anticipate amended claims 1 and 22 for the same reason Becker I does not anticipate those claims: because Becker II does not disclose an alternating current produced by an AC voltage of greater than about 100 V_{RMS}. Instead, Becker II only discloses a maximum voltage of about 50 V. Becker II col. 38 lines 56-60. It is not clear whether the voltage specified in Becker II is a peak-to-peak or RMS voltage, but in either case the voltage specified in Becker II would be well below the voltage specified in amended claims 1 and 22. Again, as was the case with Becker I, Becker II cannot anticipate the claims dependent from amended claims 1 and 22 because those dependent claims also contain the limitation of an AC voltage of greater than about 100 V_{RMS}. Therefore, claims 1-5, 8-11, and 22-25 should all now be allowable over Becker II.

V. Rejections under 35 U.S.C. § 103

Claim 12 was rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over the combination of Becker II and EP 0 816 837 (“Chow”). This rejection appears to be based on two assumptions. The first assumption is that Becker II discloses the purposeful

avoidance of electrolysis by voltage selection. Office Action pg. 7 lines 3-6. The section of Becker II cited in the Office Action does not state that electrolysis can be avoided by voltage selection. Instead, the cited section discloses that the *frequency* of the applied voltage can be selected to avoid electrolysis. Becker II col. 49 lines 49-53. The second assumption underlying the rejection is that Chow teaches the 1V voltage drop limitation in claim 12. Claim 12 requires that the voltage across an electrode/fluid *interface* be less than 1V. Chow does not appear to say anything about the voltage drop across an interface. Instead, Chow appears to teach that the dimensions of the electrode (or lead) be small enough so that the voltage variation across the electrode itself is less than 1V. Chow col. 13 line 57 – col. 14 line 3. Furthermore, this portion of Chow teaches that the electrode dimensions be made *small* to avoid electrolysis, while the pending application teaches that *increasing* the surface area of the electrode tends to minimize electrolysis. See e.g. Application pg. 8 lines 25-32. This apparent inconsistency can be reconciled by the difference in the teachings of Chow and the pending Application. Chow teaches that if a dimension of an electrode is large enough so that a voltage gradient across the electrode exceeds 1V, then electrolysis might occur. One skilled in the art would easily recognize that the voltage gradient across the electrode could be decreased by reducing the electrode dimensions or by fabricating the electrode from a more conductive material. In contrast, the pending Application teaches that if the voltage across the *interface* between the electrode and the surrounding fluid exceeds 1V, then electrolysis might occur. The Application then goes on to teach that the voltage across the interface can be decreased by increasing the surface area of the electrode. Since Becker II does not disclose the use of voltages to minimize electrolysis, and since the teachings of Chow are completely different than the teachings in the pending application, claim 12 is not obvious over the combination of Becker II and Chow.

Claims 13-20 and 26-32 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over the combination of Becker II and US Patent No. 5,645,702 (“Witt”). Amendments to claims 13 and 26, upon which all of the other rejected claims depend, address the Examiner’s rationale for this rejection.

The obviousness rejection of claims 13-20 and 26-32 over the combination of Becker II and Witt appears to be based on the rationale that Becker II discloses all of the limitations of those claims except for the use of a third electrode, which is disclosed by Witt.

Claims 13 and 26 have been amended to include the limitation that the voltage applied between each set of electrodes must be greater than 100V. Support for this amendment can be found on pg. 19 lines 6-8. As previously discussed, Becker II does not disclose voltages of more than 50V. The largest voltage disclosed in Witt is 10V. See Witt col. 3 lines 22-25. As was also previously discussed, embodiments of the claimed invention are directed toward solving the problems associated with the application of high voltages, i.e. voltages of greater than about 100V, to microfluidic channels. Since both Becker II and Witt disclose devices that operate at much lower voltages than the methods and systems covered by claims 13-20 and 26-32, those two references cannot render those claims obvious.

Conclusion

For the foregoing reasons, Applicant believes all the pending claims are in condition for allowance and should be passed to issue. If the Examiner feels that a telephone conference would in any way expedite the prosecution of the application, please do not hesitate to call the undersigned attorney.

Respectfully submitted,



Donald R. McKenna
Reg. No. 44,922

CALIPER LIFE SCIENCES, INC.
605 Fairchild Drive
Mountain View, CA 94043
Direct: 650-623-0737
Fax: 650-623-0504
donald.mckenna@caliperls.com

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I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on February 24, 2005 by Michael Moores.

Signed:



Appl. No. 10/076,135
Reply to Office Action of August 24, 2004

Amendments to the Drawings:

The sheet of drawings labeled "Replacement Sheet" that is appended to the end of this AMENDMENT AND RESPONSE is to replace the original drawing sheet containing Figures. 1 and 2. An annotated sheet of drawing showing the changes made to the original drawing sheet is also appended to the end of this AMENDMENT AND RESPONSE.



1/15

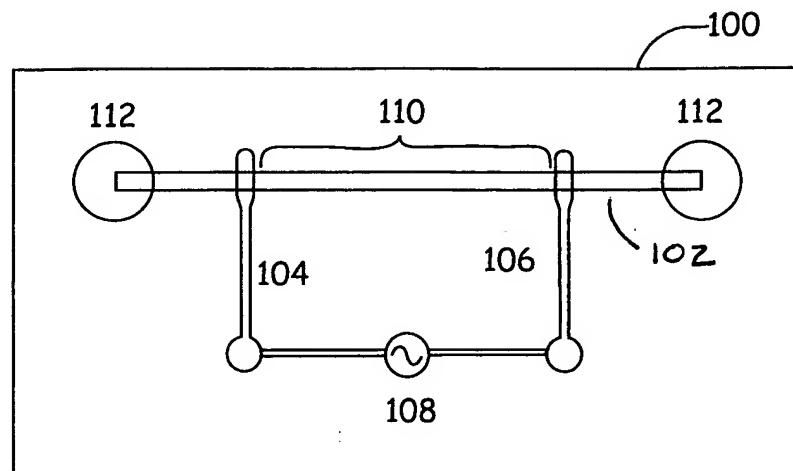


Figure 1

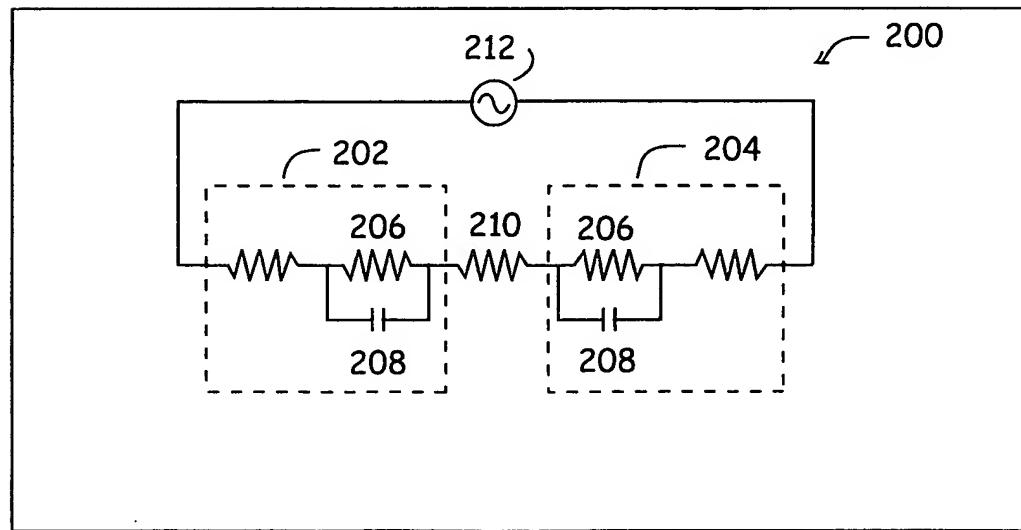


Figure 2